

# FLIGHT

## Aerodynamics of Model Rockets

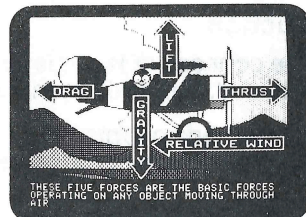
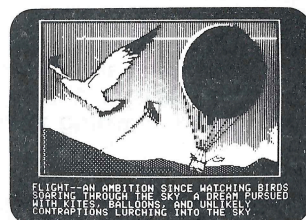
FOR APPLE IIe and IIc COMPUTERS WITH 64K MEMORY. COLOR MONITOR RECOMMENDED.

### CONTENTS:

5¼ Inch Disks  
User's Guide  
90 Day Warranty

### PROGRAMS:

Forces on Flying Objects  
Aerodynamics  
Drag  
Center of Gravity/Center of Pressure  
Stability  
"Tech Tip"



These programs help you understand why things are able to fly. Learn why kites, model airplanes, and model rockets fly. Clear graphics and easy-to-understand wording helps you understand the fundamentals of flight.

You will have frequent opportunities to interact with the computer to test your understanding as you progress.

Programs authored by Bob Cannon and Mike Dorffler.  
© Copyright 1986, Estes Industries. All Rights Reserved.  
Apple ® is a registered trademark of Apple Computer, Inc.  
"PRONTODOS" operating system used in this software is copyright ©1983 by Tom Weishaar, Overland, KS.

Animation created with TAKE 1 by Baudville.  
Graphics created with BLAZING PADDLES by Baudville.



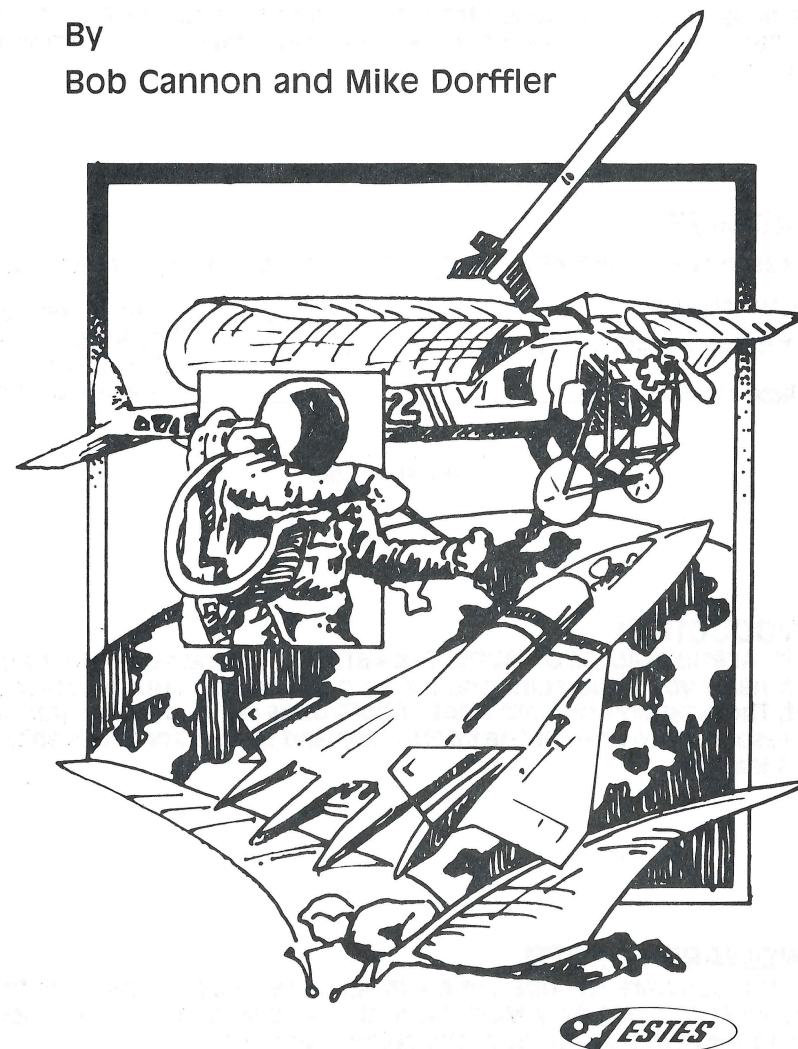
Estes Industries  
1295 H Street  
Penrose, CO 81240



No. 9026

# FLIGHT: AERODYNAMICS OF MODEL ROCKETS

By  
Bob Cannon and Mike Dorffler



### CREDITS

©Copyright Estes Industries, 1986. All Rights Reserved.

Printed in U.S.A.

FLIGHT: AERODYNAMICS OF MODEL ROCKETS, Estes Industries logo, and Tech Tip are registered trademarks of Estes Industries.

Apple is registered trademark of Apple Computer, Inc.

"PRONTODOS" Operating system used in this software is copyright

© by Tom Weishaar, Overland, KS

Animation created with TAKE 1 by Baudville.

Graphics created with BLAZING PADDLES by Baudville.

No. 9026

## COPYRIGHT

The **FLIGHT: AERODYNAMICS OF MODEL ROCKETS** software is copyrighted by Estes Industries, as is this manual. All rights are reserved. Written permission must be obtained in advance from Estes Industries to copy or in any way reproduce this manual or to make more than one back-up copy of the software.

## WARRANTY

See Warranty and Owner Registration Card enclosed with your Estes software.

### For your records:

Date purchased: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

Place purchased \_\_\_\_\_

Estes Industries  
Department 19  
1295 H Street  
Penrose, CO 81240

\_\_\_\_\_  
(city, state, zip)

## INTRODUCTION

**FLIGHT: AERODYNAMICS OF MODEL ROCKETS** is an interactive software tutorial which helps you understand the forces operating on your model rocket in flight. The programs on both sides of both disks utilize detailed graphics and user responses to present the information and to monitor and reinforce the user's learning.

## HARDWARE NEEDED

This software will operate on an Apple IIe or IIc computer with 64K or more of ROM (Read Only Memory) with one disk drive. A color monitor is needed for best enjoyment of the colorful graphics.

## GETTING STARTED

Open the door of your disk drive.

Hold the first **FLIGHT: AERODYNAMICS OF MODEL ROCKETS** disk with the label side up and facing you. Carefully place the disk in the disk drive and close the drive door.

Turn on your computer and monitor.

Follow the instructions on the screen.

*Enjoy!*

## CONTENTS OF DISKS

Introduction

Forces on Flying Objects

Aerodynamics

Drag

Center of Gravity/  
Center of Pressure

Stability

Tech Tip™

Each program contains information on its subject. The programs feature excellent graphics to aid your understanding. The programs are interactive. Frequently you will be asked questions about what is being covered. Your answers will determine what you do next. This tutorial approach reinforces what you are learning and corrects you when you do not understand.

The programs are designed to be used in the order listed. Each program builds on what was learned in the previous program.

The emphasis is on the application of each topic to model rockets, but how what you are learning affects other flying objects is discussed.

## SUMMARY OF PROGRAMS

### Introduction

The concept of flight is introduced. The importance of the relative wind is introduced. The Main Menu is included in this program.

### Forces on Flying Objects

The four basic forces on flying objects are explored.

### Aerodynamics

Factors which affect heights which model rockets can reach are examined. The effect of relative wind is further studied. The importance of angle of attack is considered. Glides, stalls, and dives are discussed.

### Drag

The factors involved in drag are studied in some detail. The factors which affect the drag encountered by your model rockets are explored. The drag formula is presented and analyzed. Common problems with drag are examined so that you can avoid them in building and flying your model rockets.

### Center of Gravity/Center of Pressure

The concepts of center of gravity and center of pressure are introduced and explained. Techniques to move these two points are discussed. The effect of center of gravity/center of pressure relationship on model rocket stability is discussed.

### Stability

The effect of center of gravity/center of pressure relationship on stability is reviewed. A method for testing stability without the use of a wind tunnel is explained.

### Tech Tip™